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AN EXAMPLE OF DISRUPTION OF ROCK BY LIGHTNING ON ONE OF THE LUCITE HILLS IN WYOMING¹

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The accompanying picture (Fig. 1) is a view on the summit of Cross Mesa,² one of the Lucite Hills near Rock Springs, Wyoming.

This mesa, like most of the group, is quite barren and flat on top, the volcanic rock of which it is composed being unprotected by soil and vegetation. Like the other Lucite Hills it is a very prominent landmark standing well above the surrounding country.

The angular boulders seen in the picture have been torn by some apparently violent force from the surface of the lava and some of them still lie in the cavity formed. The space from which the rock fragments were torn is roughly a half-saucer in shape, having the east rim nearly vertical while on the opposite side it is more gently sloping. Two or three cracks, one of which may be observed near the right lower corner of the picture, radiate from the saucer-shaped depression. Whether some of these cracks may not have occurred before the disruption the writer was not able to judge, but it is not likely that all of them did so occur. The rock fragments range in size from an inch or two in diameter up to about two feet and a half, and are sharply angular with fresh surfaces. From the size of the cavity the amount of rock removed is approximately twelve cubic feet and lies within a radius of about ten feet from the fracture and exclusively to the west of it. No fragments were observed to have been thrown very far.

Two hypotheses at once present themselves in explanation of this phenomenon: first, that of an artificial explosion as dynamite or blasting powder; second, that of lightning.

The probabilities of this being due to the first hypothesis seem very slight since it is so far removed from human activities of any

¹ Published by permission of the Director of the U. S. Geological Survey.

² J. F. Kemp and W. C. Knight, "Lucite Hills of Wyoming," *Bull. Geol. Soc. Amer.*, Vol. XIV, 1902, p. 317.

kind. The nearest trail is in Long Cañon, one mile northwest and four hundred feet lower down. Over this trail there is perhaps not more than one person a week during summer and probably fewer in winter. Several coal prospects have been opened, however, during the last five or six years, in Back Cañon and also in Long Cañon, not more than five miles to the south, but giant powder only was used in shooting. Had a prospector been so disposed it is the writer's opinion he could not have produced the effect shown in this photograph with



FIG. 1.—View on top of Cross Mesa, Wyoming, showing fragments torn from the lava by lightning.

ordinary blasting powder. He certainly could not have done it without a drill hole and no evidence of holes were observed. Even with a drill hole it would have been very hard, if not impossible, to have confined the powder sufficiently well. Furthermore, from the very nature of the rock (lava), a prospector would not have been looking for minerals in this place, and if he had been doing it for amusement he almost certainly would have selected a crevice at the limiting cliff of the mesa where the explosion would have loosened a large mass of

rock and sent it tumbling down the steep slope which falls away from the escarpment.

The other hypothesis, that of lightning, seems the more probable, and the writer wishes to call attention to it as an example of a kind of phenomenon rather rarely noted in geological literature. A few instances of the disruptive effects of lightning are on record.

Hibbert¹ describes as follows the effect of lightning on the cliffs of micaceous schist on the east side of the island of Fetlar, one of the Shetland Islands.

A rock 105 feet long, 10 feet broad, and in some places more than 4 feet thick, was, in an instant, torn from its bed, and broken into three large and several lesser fragments. One of these, 26 feet long, 10 feet broad, and 4 feet thick, simply turned over. The second, which was 28 feet long, 17 feet broad, and 5 feet in thickness, was hurled across a high point of a rock to the distance of 50 yards. Another broken mass, about 40 feet long, was thrown still farther but in the same direction, quite into the sea. There were also many lesser fragments scattered up and down.

T. R. Dakyns, in his paper on "Modern Denudation in N. Wales,"² says:

During the great thunderstorm that occurred in N. Wales in the middle of August, 1898, a mass of rock was broken and thrown down the Llyn Teyrn. This is known to have been done by lightning, as it was not there until after the storm.

In a conversation with the writer, George Otis Smith has stated that during a thunderstorm in 1904, he observed lightning strike on the summit of Mt. Battie, in the northern portion of the Rockland quadrangle³ (Maine), and a mass of quartzitic conglomerate several feet in diameter was broken from the glaciated surface and thrown out.

While the most commonly observed effects of lightning on rocks seems to be that of fusion resulting in the production of fulgurites or glassy coatings,⁴ no evidence of fulgurites nor of glassy coatings was observed either on these fragments or in the cavity from which they were thrown, but since lightning of the disruptive type is apparently

¹ Samuel Hibbert, *Description of the Shetland Islands*, 1822, p. 389. For this account of lightning effect Hibbert says he is indebted to Geo. Low, *M. S. of Rev.*

² *Geological Magazine*, new series, Vol. VII, 1900, No. 1, p. 19.

³ *Rockland Folio No. 158*, U. S. Geol. Survey, May, 1908.

⁴ R. R. Julian, "A Study of the Structure of Fulgurites," *Jour. Geol.*, Vol. IX, 1901, pp. 673-93.

not always accompanied by high temperatures, it does not follow that this phenomenon may not have been caused by lightning.

The most evident effect of lightning is of the disruptive type observed almost every day in the form of splintered telegraph poles and shattered trees and buildings. Lightning, producing this class of results, does not seem always to be accompanied by high temperatures. The writer has observed one instance at least in which a perfectly dry wooden building was shattered without a tendency to firing it.